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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/807,932
Filing Date: March 23, 2004
Appellant(s): WEI, QINGQIAO

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Timothy F. Myers
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 3/23/2010 appealing from the Office action mailed 3/25/2009.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

| | | |
|---|---|---|
| **6,509,619** | **Kendall et al** | **1-2003** |
| **3,897,274** | **Stehlin et al** | **7-1975** |

**Briand et al, Journal of Microelectromechanical Systems, vol. 9, No. 3, September 2000.**

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-2, 6-10, 14-15, 17-18, 20-24, 27, 29-31, 56-59 are rejected under 35 U.S.C. 103(a) as obvious over Kendall et al (USP 6,509,619, hereinafter "Kendall") in view of Briand et al (Journal of Microelectromechanical Systems, vol. 9, No. 3, September 2000) (see reference 1R on IDS filed on 3/23/2004).

Regarding claims 1, 6-7, 17, 27, 56, Kendall teaches a metal oxide semiconductor field effect transistor for gas and liquid testing comprising ("a fluid sensor for use in an environment having an ambient temperature") (col. 4 lines 20-24) comprising:

a field-effect transistor (FET) comprising a functionalized semiconductor nanowire (col. 12 lines 25-32), including at least one catalyst, the catalyst such as gold. The material capable of interacting with a fluid to be sensed and effecting a change of an electrical characteristic of the FET;

Kendall teaches the thin membranes may be heated and cooled in incredibly short times (Figure 12: "H"). It is not clear if Kendall teaches an integral heater.

integral thermal insulation SIM-NOX disposed to maintain the field-effect transistor at the elevated temperature.

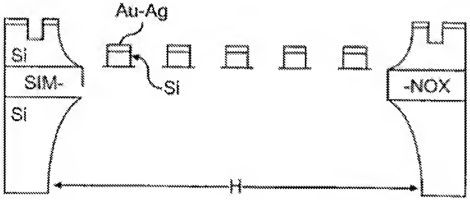


*FIG. 12*

Kendall is silent about the device further comprising a control device on the substrate comprising a non-functionalized semiconductor nano-wire otherwise identical to the FET and at least one integral temperature sensor on the substrate.

Briand et al teach a MOSFET array gas sensor comprising a silicon chip with four MOSFETs, a temperature sensor diode, and an integral heater. Three of the four MOSFETs are functionalized with catalytic metals, whereas the fourth one has a standard gate covered with nitride and used as a reference ("control device on the substrate comprising a non-functionalized semiconductor otherwise identical to the FET") (Abstract). It is desirable to provide an integral heater and temperature sensor because it provides a way to control the operating temperature of the sensor (Pg. 305 col. 2 para. 1 and pg. 306 col. 2 para 1). It is desirable to provide a reference because

it provides a baseline reading to compare to the reading of the other MOSFET sensors. It is desirable to provide the sensor in an array because it allows different fluids to be tested.

Therefore it would have been obvious to one of ordinary skill in the art as motivated by Briand et al, to provide an array of MOSFET sensors of Kendall on a substrate as in Briand et al in order to detect several different fluids with one device without changing the catalytic metal.

Therefore it would have been obvious to one of ordinary skill in the art as motivated by Briand to combine a temperature sensor and an integral heater in the MOSFET device of Kendall in order to control operating temperature of the sensor.

Therefore it would have been obvious to one of ordinary skill in the art as motivated by Briand to combine the reference MOSFET ("control device") in the MOSFET device of Kendall in order to provide a baseline reading to compare to the MOSFET sensor with the catalyst metal.

Regarding claim 2, Kendall/Briand teach the functionalized semiconductor nanowire comprises silicon (Figure 12)

Regarding claim 8-9, Kendall/Briand teach the metals are a porous gate layer ("catalyst comprises a porous thin layer of catalyst material" " pores of the porous thin layer of catalyst material extend at least partially through the thin layer of catalyst material") (col. 8 lines 52-66)

Regarding claim 10, Kendall/Briand teaches the nanowindows, which are nanogrooves that go all the way through the membrane. The thin membranes of the

nanowires are made of the metals ("wherein the catalyst comprises a mesh formed by thin filaments of catalyst material") (col. 3 lines 60-67).

Regarding claim 14-15, Kendall/Briand teaches a substrate made of silicon on an insulator comprising silicon oxide that holds the MOSFET ("further comprising a substrate for supporting the field-effect transistor" "the substrate are formed from a layer of silicon on an insulator (SOI)" "wherein the integral thermal insulation is disposed on the substrate") (col. 11 lines 10-34, Figure 12).

Regarding claim 17-18, Kendall/Briand teaches wherein the integral heater is disposed on the substrate (Briand: Figure 3: Heater)

Regarding claims 20, Kendall/Briand teaches the field-effect transistor (FET) is disposed on the substrate and the thermal insulation (Kendall: Figure 11 and 12)

Regarding claim 21, Kendall/Briand teaches wherein a portion of the substrate is removed to form an opening under the field-effect transistor (FET), the opening being at least partially aligned with the field-effect transistor (Figure 12)

Regarding claims 22-23, Kendall/Briand teaches the MOSFET ("field-effect transistor") comprises a SIMNOX layer (broadly interpreted reads on "substrate" "includes a gate electrically insulated from the substrate") (Figure 12: Si) which is fully capable of serving as a gate for the field-effect transistor.

Regarding claim 24, Kendall/Briand teach the gold-silver layer ("conductive catalyst") on silicon ("functionalized semiconductor nano-wire") is insulated from the substrate by SIMNOX layer which is fully capable of providing a gate for the field-effect transistor (Fig. 12).

Regarding claim 29-31, Kendall/Briand teach the array comprises a long chain molecules 110 such as DNA, RNA, polypeptides, etc specific for binding large molecules 118. The arrays can have the same or differing receptors ("is functionalized for detecting a particular substance" "array is functionalized for detecting a distinct substance" "wherein the field-effect transistors of a number of the fluid sensors of the array are functionalized for detecting the same substance").

Regarding claim 56-57, Kendall/Briand teach a metal oxide semiconductor field effect transistor for gas and liquid testing comprising ("a fluid sensor for use in an environment having an ambient temperature") (col. 4 lines 20-24) a field-effect transistor (FET) comprising a functionalized semiconductor nanogroove ("nanowire"), including a coating 208 comprising silicon dioxide ("coating comprises at least one dielectric layer of an oxide or a nitride that can be protonated or deprotonated for the detection of protons" "integral thermal insulation disposed to maintain the field-effect transistor at the elevated temperature")

Regarding claim 58-59, Kendall teach the dielectric layer has a long chain molecule 210 such as DNA, RNA, or Polypeptides on its surface ("the coating comprises at least one organic species selected from the list consisting of antibodies, antigens, polymers, polynucleic acids, polypeptides, nanoparticles, ion exchange membranes, and combinations thereof" "wherein the coating comprises at least one substance selected from the list consisting of thiols, amines, silanols, alcohols, sugars, Lewis acids, Lewis bases, dipoles, nucleic acids, peptides, and combinations thereof") (col. 4 lines 1-5).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kendall in view of Briand et al (Journal of Microelectromechanical Systems, vol. 9, No. 3, September 2000) and further in view of Stehlin et al (USP 3,897,274).

Kendall/Briand teach the limitations of claim 1 as per above.

Regarding claim 3, Kendall/Briand teach the SIMNOX process for producing an oxide layer under a single crystal layer. Kendall is silent about the silicon in the functionalized semiconductor nano-wire is doped.

Stehlin et al teach a method of fabricating dielectrically isolated semiconductor structures wherein n-type silicon is used as the starting material to provide a suitable final insulating compound semiconductor (col. 6 line 45-50). It is well known to use doped silicon as starting material for semiconductor insulating layers.

It would have been obvious to one of ordinary skill in the art as motivated by Stehlin et al to dope the functionalized semiconductor nanowire because it is well known to provide doped dielectric layers as starting material in order to form a silicon over insulating substrate.

**(10) Response to Argument**

Appellant argues that one of ordinary skill in the art would not combine Briand with Kendall because both Kendall and Briand have teachings for detecting gases or fluids which would lead one away from doing the fluid detection in the manner claimed. Appellants argue that Briand teaches the use of an integral heater to gas sensors to typical operating temperatures and that the actual selection of gas sensistivity is performed by having the "GasFets having three different catalytic metals", whereas the

appellant is using the ability to calibrate the sensor to detect different gases by operating at different temperatures. The Appellant further argues that Briand doesn't even know if the sensor is capable of such operation or that even a more sensitive type of sensor will be required. Appellant argues that Kendall, when describing the membranes may be heated and cooled in incredibly short times, is actually describing such an effect in terms of using the gas sensor as an environmental or flow sensor which does not suggest using the increased sensitivity to detect different gases at different temperature profiles. These arguments are not persuasive because the Appellant argues that the use of the temperature sensor and integral heater of Briand is for a different purpose than the present application, namely "allow control and selection of temperatures for at least one of calibration and setting of gas sensitivity". These limitations are considered functional process or intended use limitations, which do not further delineate the structure of the claimed apparatus from that of the prior art. Since these claims are drawn to an apparatus statutory class of invention, it is the structural limitations of the apparatus, as recited in the claims, which are considered in determining the patentability of the apparatus itself. These recited process or intended use limitations are accorded no patentable weight to an apparatus. Process limitations do not add patentablility to a structure, which is not distinguished from the prior art. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See In re Casey, 152 USPQ 235

(CCPA 1967); and In re Otto, 136 USPQ 458, 459 (CCPA 1963). The Courts have held that it is well settled that the recitation of a new intended use, for an old product, does not make a claim to that old product patentable. See In re Schreiber, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997). The Courts have held that the manner of operating an apparatus does not differentiate an apparatus claim from the prior art, if the prior art apparatus teaches all of the structural limitations of the claim. See Ex Parte Masham, 2 USPQ2d 1647 (BPAI 1987) (see MPEP § 2114). In this case the temperature sensor and integral heater of Briand is obvious to combine with the device of Kendall because it allows one to control the operating temperature of the assay.

Appellants argue that Kendall does not have “functionalized semiconductor nano-wire” because the Kendall recites "at least one elongated molecule located in at least one of the nanogrooves". It is noted that "functionalized semiconductor nano-wire" is sufficiently broad to read on a long chain molecule on the surface of the nanogroove.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner’s answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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